

ANNA UNIVERSITY, CHENNAI
NON- AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
M.E. ENGINEERING DESIGN
REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND I SEMESTERS SYLLABUS

SEMESTER I

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	ED4151	Advanced Mechanics of Materials	PCC	3	1	0	4	4
2	ED4152	Advanced Mechanisms in Design	PCC	3	0	0	3	3
3	ED4153	Computer Applications in Design	PCC	3	0	0	3	3
4	ED4154	Vibration Analysis and Control	PCC	3	0	0	3	3
5	RM4151	Research Methodology and IPR	PCC	2	0	0	2	2
6		Professional Elective- I	PEC	3	0	0	3	3
7		Audit Course-I*	AC	2	0	0	2	0
PRACTICAL								
8	ED4111	CAD and Design for Manufacture and Assembly Laboratory	PCC	0	0	4	4	2
9	ED4161	Vibration Laboratory	PCC	0	0	4	4	2
TOTAL				19	1	8	28	22

* Audit Course is optional

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	ED4201	Mechanical Behavior of Materials	PCC	3	0	0	3	3
2.	ED4251	Finite Element Methods in Mechanical Design	PCC	3	1	0	4	4
3.	PD4152	Integrated Product Development	PCC	3	0	0	3	3
4.		Professional Elective -II	PEC	3	0	0	3	3
5.		Professional Elective-III	PEC	3	0	0	3	3
6.		Professional Elective-IV	PEC	3	0	0	3	3
7.		Audit Course-II*	AC	2	0	0	2	0
PRACTICAL								
8.	ED4261	Simulation and Analysis Laboratory	PCC	0	0	4	4	2
9.	PD4261	Product Design Laboratory	PCC	0	0	4	4	2
TOTAL				20	1	8	29	23

* Audit Course is optional

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Professional Elective-V	PEC	3	0	0	3	3
2		Professional Elective-VI	PEC	3	0	0	3	3
3		Open Elective	OEC	3	0	0	3	3
PRACTICAL								
4	ED4311	Technical Seminar	EEC	0	0	2	2	1
5	ED4312	Project Work I	EEC	0	0	12	12	6
TOTAL				9	0	14	23	16

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICAL								
1	ED4411	Project Work II	EEC	0	0	24	24	12
TOTAL				0	0	24	24	12

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE: 73

PROFESSIONAL ELECTIVE COURSES

SEMESTER I, ELECTIVES I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CD4152	Design for Sustainability	PEC	3	0	0	3	3
2.	ED4072	Composite Materials and Mechanics	PEC	3	0	0	3	3
3.	ED4074	Design of Hydraulic and Pneumatic Systems	PEC	3	0	0	3	3
4.	ED4079	Quality Concepts in Design	PEC	3	0	0	3	3
5.	MA4071	Applied Probability and Statistics for Design Engineers	PEC	3	0	0	3	3

SEMESTER II, ELECTIVES II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ED4001	Surface Engineering	PEC	3	0	0	3	3
2.	ED4002	Design of Machine Tool	PEC	3	0	0	3	3
3.	PD4351	Product Lifecycle Management	PEC	3	0	0	3	3
4.	AO4071	Artificial Intelligence and Machine Learning	PEC	3	0	0	3	3

SEMESTER II, ELECTIVES III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	ED4078	Optimization Techniques in Design	PEC	3	0	0	3	3
2	CD4071	Bio Materials	PEC	3	0	0	3	3
3	ED4077	Mechanical Measurements and Analysis	PEC	3	0	0	3	3
4	ED4003	Design for X	PEC	3	0	0	3	3
5	MR4071	Internet of Things	PEC	3	0	0	3	3

SEMESTER II, ELECTIVES IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	ED4081	Vehicle Dynamics	PEC	3	0	0	3	3
2	ED4075	Engineering Fracture Mechanics	PEC	3	0	0	3	3
3	CM4152	Solid Freeform Manufacturing	PEC	3	0	0	3	3
4	ED4080	Tribology in Design	PEC	3	0	0	3	3
5	CD4074	Wearable Devices and Technologies	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE V

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	ED4071	Advanced Finite Element Analysis	PEC	3	0	0	3	3
2	ED4073	Design of Hybrid and Electric Vehicles	PEC	3	0	0	3	3
3	ED4004	Bearing Design and Rotor Dynamics	PEC	3	0	0	3	3
4	ED4076	Material Handling Systems and Design	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE VI

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	PD4151	Creativity and Innovation	PEC	3	0	0	3	3
2	IC4251	Computational Fluid Dynamics	PEC	3	0	0	3	3
3	CD4073	Principles of Supply Chain Management	PEC	3	0	0	3	3
4	II4071	Industry 4.0	PEC	3	0	0	3	3

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0

ED4151	ADVANCED MECHANICS OF MATERIALS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

1. To learn the concepts of theory of elasticity in three-dimensional stress system.
2. To study the shear centre of various cross-sections and deflections in beams subjected to unsymmetrical bending.
3. To learn the stresses in flat plates and curved members.
4. To study torsional stress of non-circular sections.
5. To learn the stresses in rotating members, contact stresses in point and line contact applications.

UNIT-I ELASTICITY 9+3

Stress-Strain relations and general equations of elasticity in Cartesian, Polar and curvilinear coordinates, differential equations of equilibrium – compatibility - boundary conditions - representation of three - dimensional stress of a tension generalized hook's law - St. Venant's principle - planestress - Airy's stress function. Energy methods.

UNIT-II SHEAR CENTRE AND UNSYMMETRICAL BENDING 9+3

Location of shear centre for various thin sections - shear flows. Stresses and Deflections in beams subjected to unsymmetrical loading-kern of a section.

UNIT-III STRESSES IN FLAT PLATES AND CURVED MEMBERS 9+3

Circumference and radial stresses – deflections - curved beam with restrained ends - closed ring subjected to concentrated load and uniform load - chain links and crane hooks. Solution of rectangular plates – pure bending of plates – deflection – uniformly distributed load – various end conditions

UNIT-IV TORSION OF NON-CIRCULAR SECTIONS 9+3

Torsion of rectangular cross section - St.Venants theory - elastic membrane analogy - Prandtl's stress function - torsional stress in hollow thin walled tubes.

UNIT-V STRESSES IN ROTATING MEMBERS AND CONTACT STRESSES 9+3

Radial and tangential stresses in solid disc and ring of uniform thickness and varying thickness allowable speeds. Methods of computing contact stress-deflection of bodies in point and line contact applications.

TOTAL = 60 PERIODS

COURSE OUTCOMES:

On Completion of the course the student will be able to

- CO1** Apply the concepts of theory of elasticity in three-dimensional stress system.
- CO2** Determine the shear centre of various cross-sections and deflections in beams subjected to unsymmetrical bending.
- CO3** Evaluate the stresses in flat plates and curved members.
- CO4** Calculate torsional stress of non-circular sections.
- CO5** Determine the stresses in rotating members, contact stresses in point and line contact applications.

REFERENCES:

1. Arthur P Boreasi, Richard J.Schmidt, "Advanced Mechanics of Materials", Wiley India Pvt.Ltd., 2009.
2. Hibbeler. R.C., "Mechanics of Materials", Prentice-Hall, 2018.
3. Robert D.Cook, Warren C.Young, "Advanced Mechanics of Materials", Prentice Hall, 1999.
4. Srinath. L.S., "Advanced Mechanics of Solids", Tata McGraw Hill, 2009.
5. Timoshenko and Goodier, "Theory of Elasticity", Tata McGraw Hill, 2010.

ED4152	ADVANCED MECHANISMS IN DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

1. To learn the concepts of gross motion capability and develop multi loop kinematic chains and equivalent mechanisms
2. To study complex mechanisms to determine velocity and acceleration of output links.
3. To learn to locate inflection points and to draw the inflection circle
4. To study the synthesis of planar mechanisms
5. To learn to design of six bar coupler driven mechanisms and cam mechanisms

UNIT-I INTRODUCTION 9

Review of fundamentals of kinematics-classifications of mechanisms-components of mechanisms – mobility analysis – formation of one D.O.F. multi loop kinematic chains, Network formula – Gross motion concepts-Basic kinematic structures of serial and parallel robot manipulators-Compliant mechanisms - Equivalent mechanisms.

UNIT-II KINEMATIC ANALYSIS 9

Position Analysis – Vector loop equations for four bar, slider crank, inverted slider crank, geared five bar and six bar linkages. Analytical methods for velocity and acceleration Analysis–four bar linkage jerk analysis. Plane complex mechanisms-auxiliary point method. Spatial RSSR mechanism-Denavit-Hartenberg Parameters – Forward and inverse kinematics of robot manipulators.

UNIT-III PATH CURVATURE THEORY, COUPLER CURVE 9

Fixed and moving centrodes, inflection points and inflection circle. Euler Savary equation, graphical constructions – cubic of stationary curvature. Four bar coupler curve-cusp -cunode -coupler driven six-bar mechanisms-straight line mechanisms

UNIT-IV SYNTHESIS OF FOUR BAR MECHANISMS 9

Type synthesis – Number synthesis – Associated Linkage Concept. Dimensional synthesis – function generation, path generation, motion generation. Graphical methods-Pole technique inversion technique-point position reduction-two, three and four position synthesis of four- bar mechanisms. Analytical methods- Freudenstein’s Equation-Bloch’s Synthesis.

UNIT-V SYNTHESIS OF COUPLER CURVE BASED MECHANISMS & CAM MECHANISMS 9

Cognate Linkages-parallel motion Linkages. Design of six bar mechanisms-single dwell-double dwell-double stroke. Geared five bar mechanism-multi-dwell. Cam Mechanisms-determination of optimum size of cams. Mechanism defects. Study and use of Mechanism using Simulation Soft-ware packages. Students should design and fabricate a mechanism model as term project.

TOTAL = 45 PERIODS

COURSE OUTCOMES:

On Completion of the course the student will be able to

1. Apply concepts of gross motion capability and develop multi loop kinematic chains and equivalent mechanisms
2. Determine velocity and acceleration of complex mechanisms
3. Evaluate inflection points and draw the inflection circle
4. Synthesise planar mechanisms
5. Design of six bar coupler driven mechanisms and cam mechanisms

REFERENCES:

1. Amitabha Ghosh and Asok Kumar Mallik, "Theory of Mechanism and Machines", EWLP, Delhi, 1999.
2. Kenneth J, Waldron, Gary L. Kinzel, "Kinematics, Dynamics and Design of Machinery", John Wiley-sons, 2016.
3. Robert L.Norton., "Design of Machinery", Tata McGraw Hill, 2012
4. Sandor G.N., and Erdman A.G., "Advanced Mechanism Design Analysis and Synthesis", Prentice Hall, 1984.
5. Uicker, J.J., Pennock, G. R. and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, 2017.

ED4153	COMPUTER APPLICATIONS IN DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To understand fundamental concepts of computer graphics and its tools in a generic framework.
2. To impart the parametric fundamentals to create and manipulate geometric models using curves, surfaces and solids.
3. To impart the parametric fundamentals to create and manipulate geometric models using NURBS and solids.
4. To provide clear understanding of CAD systems for 3D modeling and viewing.
5. To create strong skills of assembly modeling and prepare the student to be an effective user of a standards in CAD system.

UNIT – I INTRODUCTION TO COMPUTER GRAPHICS FUNDAMENTAL 9

Overview of Graphics systems: Video Display Devices, Raster-Scan System, Random-Scan Systems, Graphics Monitors and Workstations, Input Devices, Hard-Copy Devices, Graphics Software.

Output primitives: Line Drawing Algorithm - DDA, Bresenham's and Parallel Line Algorithm. Circle generating algorithm – Midpoint Circle Algorithm.

Geometric Transformations: Coordinate Transformations, Windowing and Clipping, 2D Geometric transformations -Translation, Scaling, Shearing, Rotation and Reflection, Composite transformation, 3D transformations.

UNIT – II CURVES AND SURFACES MODELLING 9

Introduction to curves - Analytical curves: line, circle and conics – synthetic curves: Hermite cubic spline- Bezier curve and B-Spline curve – curve manipulations.

Introduction to surfaces - Analytical surfaces: Plane surface, ruled surface, surface of revolution and tabulated cylinder – synthetic surfaces: Hermitebicubic surface- Bezier surface and B-Spline surface- surface manipulations.

COURSE OBJECTIVES

1. To appreciate the basic concepts of vibration in damped and undamped systems
2. To calculate the natural frequencies and mode shapes of the two degree freedom systems
3. To determine the natural frequencies and mode shapes of the multi degree freedom and continuous systems
4. To learn the fundamentals of control techniques of vibration and noise levels
5. To use the instruments for the measuring and analyzing the vibration levels in a body

UNIT-I FUNDAMENTALS OF VIBRATION 9+3

Introduction -Sources of Vibration-Mathematical Models- Displacement, velocity and Acceleration- Review Of Single Degree Freedom Systems -Vibration isolation Vibrometers and accelerometers - Response To Arbitrary and non- harmonic Excitations – Transient Vibration –Impulse loads- Critical Speed Of Shaft-Rotor systems

UNIT-II TWO DEGREE FREEDOM SYSTEM 9+3

Introduction-Free Vibration Of Undamped And Damped - Forced Vibration With Harmonic Excitation System –Coordinate Couplings And Principal Coordinates.

UNIT-III MULTI-DEGREE FREEDOM SYSTEM AND CONTINUOUS SYSTEM 9+3

Multi Degree Freedom System –Influence Coefficients and stiffness coefficients- Flexibility Matrix and Stiffness Matrix – Eigen Values and Eigen Vectors-Matrix Iteration Method –Approximate Methods: Dunkerley, Rayleigh's, and Holzer Method -Geared Systems-Eigen Values & Eigenvectors for large system of equations using sub space, Lanczos method - Continuous System: Vibration of String, Shafts and Beams

UNIT-IV VIBRATION AND NOISE CONTROL 9+3

Specification of Vibration Limits – Vibration severity standards- Vibration as condition Monitoring Tool-Vibration Isolation methods - Dynamic Vibration Absorber - Static and Dynamic Balancing machines – Field balancing - Major sources of noise – Noise survey techniques – Measurement technique for vehicular noise – Road vehicle noise standards – Industrial noise sources – Control Strategies – Noise control at the source and along the path – use of acoustic barriers – Noise control at the receiver.

UNIT-V EXPERIMENTAL METHODS IN VIBRATION ANALYSIS 9+3

Vibration Analysis Overview - Experimental Methods in Vibration Analysis.-Vibration Measuring Instruments - Selection of Sensors- Accelerometer Mountings. -Vibration Exciters-Mechanical, Hydraulic, Electromagnetic And Electrodynamics –Frequency Measuring Instruments-. System Identification from Frequency Response -Testing for resonance and mode shapes

TOTAL = 60 PERIODS**COURSE OUTCOMES:**

On Completion of the course the student will be able to

- CO1** Apply the basic concepts of vibration in damped and undamped systems
- CO2** Determine the natural frequencies and mode shapes of the two degree freedom systems.
- CO3** Calculate the natural frequencies and mode shapes of the multi degree freedom and continuous systems
- CO4** Control the vibration and noise levels in a body
- CO5** Measure and analyze the vibration levels in a body

REFERENCES:

1. Graham Kelly, Sand Shashidhar K. Kudari, "Mechanical Vibrations", Tata McGraw – Hill Publishing Com. Ltd., 2007
2. Singiresu S. Rao,"Mechanical Vibrations,"Pearson Education Incorporated, 2017
3. Ramamurti.V,"MechanicalVibrationPracticewithBasicTheory",NarosaPublishingHouse, 2010
4. WilliamT.Thomson,"TheoryofVibrationwithApplications",Taylor&Francis,2018

RM4151**RESEARCH METHODOLOGY AND IPR****L T P C
2 0 0 2****UNIT I RESEARCH DESIGN 6**

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES 6

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING 6

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS 6

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS 6

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL : 30 PERIODS**REFERENCES**

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.

ED4111 CAD AND DESIGN FOR MANUFACTURE AND ASSEMBLY LABORATORY

L T P C
0 0 4 2

- **CAD Introduction.**
- **Sketcher**
- **Solid modeling** – Extrude, Revolve, Sweep, etc and Variational sweep, Loft ,etc
- **Surface modeling** –Extrude, Sweep, Trim, etc and Mesh of curves, Free form etc
- **Feature manipulation** – Copy, Edit, Pattern, Suppress, History operations etc.
- **Assembly** - Constraints, Exploded Views, Interference check
- **Drafting** - Layouts, Standard & Sectional Views, Detailing & Plotting.

Exercises in modeling and drafting of mechanical components - assembly using parametric and feature based packages. 2D TO 3D CONVERSION.

DESIGN FOR MANUFACTURE AND ASSEMBLY LABORATORY

Introduction to Design for Assembly and Manufacturability (DFA/DFM)- The New Product Design (NPD) Process-Design for Assembly –Assembly Method Selection-Design for Assembly – Boothroyd - Dewhurst Method-Cost Estimation Using DFM
The students will be given training on the use and application of the following

1. DFMA software

30

TOTAL: 60 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

CO1 Use the modern engineering tools necessary for engineering practice

CO2 Draw 2D part drawings, sectional views and assembly drawings as per standards.

CO3 Create 3D Model on any CAD software.

CO4 Convert 3D solid models into 2D drawing and prepare different views, sections and dimensioning of part models.

CO5 familiarize with DFMA package which is necessary for cost estimation and evaluating the product design

COURSE OBJECTIVE:

1. To evaluate the stiffness and natural frequency of spring-mass systems.
2. To determine the natural frequencies of damped and undamped torsional vibrations of single rotor systems and obtain the radius of gyration of a body through torsional oscillations.
3. To acquire the critical speed of shaft supported at its ends.
4. To assess the natural frequency, damping coefficient, mode shapes of specimens under free vibrations.
5. To determine the natural frequency of specimens under forced vibrations

LIST OF EXPERIMENTS:**30**

- 1) Determination of stiffness and natural frequency of undamped spring-mass systems arranged in series, parallel and series-parallel fashions
- 2) Determination of effective radius of gyration of an irregular body through torsional oscillation of tri filar suspension
- 3) Determination of natural frequency a single rotor un damped shaft system
- 4) Determination of natural frequency a single rotor damped shaft system
- 5) Determination of critical speed of shaft
- 6) Determination of natural frequency and mode shapes of specimens supported at its ends through modal analysis
- 7) Determination of damping coefficient of specimens supported at its ends
- 8) Forced vibration of specimens supported under simply supported and cantilever boundary conditions – Determination of natural frequency

TOTAL: 60 PERIODS**COURSE OUTCOMES:**

On Completion of the course the student will be able to

- CO 1** Evaluate the stiffness and natural frequency of spring-mass systems.
- CO 2** Determine the natural frequencies of damped and undamped torsional vibrations of single rotor systems
- CO 3** Acquire the critical speed of shaft supported at its ends.
- CO 4** Assess the natural frequency, damping coefficient, mode shapes of specimens under free vibrations.
- CO 5** Determine the natural frequency of specimens under forced vibrations.

COURSE OBJECTIVES

1. Selecting the relevant process; applying the general design principles for manufacturability; GD & T.
2. Applying the design considerations while designing the cast and welded components.
3. Applying the design considerations while designing the formed and machined components.
4. Apply design considerations for assembled systems.
5. Apply design considerations for environmental issues.

UNIT-I INTRODUCTION**9**

Introduction - Economics of process selection - General design principles for manufacturability; Geometric Dimensioning & Tolerance (GD&T)- Formtolerancing: straightness, flatness, circularity, cylindricity - Profile tolerancing: profile of a line, and surface - Orientation tolerancing: angularity, perpendicularity, parallelism - Location tolerancing: position, concentricity, symmetry - run out tolerancing: circular and total-Supplementary symbols.

UNIT-II CAST&WELDED COMPONENTS DESIGN**9**

Design considerations for: Sand cast - Die cast - Permanent mold parts. Arc welding - Design considerations for: Cost reduction - Minimizing distortion - Weld strength - Weldment. Resistance welding-Design considerations for: Spot-Seam-Projection-Flash & Upset weldment

UNIT-III FORMED & MACHINED COMPONENTS DESIGN**9**

Design considerations for: Metal extruded parts - Impact/Cold extruded parts - Stamped parts - Forged parts. Design considerations for: Turned parts- Drilled parts - Milled, planned, shaped and slotted parts-Ground parts.

UNIT-IV DESIGN FOR ASSEMBLY**9**

Design for assembly - General assembly recommendations - Minimizing the no. of parts - Design considerations for: Rivets - Screw fasteners - Gasket & Seals - Press fits - Snap fits - Automatic assembly- Computer Application for DFMA.

UNIT-V DESIGN FOR ENVIRONMENT**9**

Introduction- Environmental objectives-Global issues-Regional and local issues-Basic DFE methods-Design guide lines-Example application-Life cycle assessment-Basic method-AT&T's environmentally responsible product assessment-Weighted sum assessment method-Life cycle assessment method-Techniques to reduce environmental impact-Design to minimize material usage-Design for disassembly-Design for recyclability-Design for manufacture-Design for energy efficiency -Design to regulations and standards.

TOTAL = 45 PERIODS**COURSE OUTCOMES:**

Upon completion of this course, the students will be able to:

1. Select relevant process; apply the general design principles for manufacturability; GD&T.
2. Apply design considerations while designing the cast and welded components.
3. Apply design considerations while designing the formed and machined components.
4. Apply design considerations for assembled systems.
5. Apply design considerations for environmental issues.

REFERENCES:

1. Boothroyd, G, 2nd Edition 2002, Design for Assembly Automation and Product Design. New York, Marcel Dekker.
2. Bralla, Design for Manufacture handbook, McGrawhill, 1999
3. Boothroyd, G, Hertz and Nike, Product Design for Manufacture, Marcel Dekker, 1994
4. Dickson, John.R, and Corroda Poly, Engineering Design and Design for Manufacture and Structural Approach, Field Stone Publisher, USA, 1995
5. Fixel, J. Design for the Environment McGraw Hill., 2nd Edition 2009
6. Graedel T. Allen By.B, Design for the Environment Angle Wood Cliff, Prentice Hall. Reason Pub., 1996
7. Kevin Otto and Kristin Wood, Product Design. Pearson Publication, (Fourth Impression) 2009
8. Harry Peck, Designing for manufacture, Pitman-1973

ED4072**COMPOSITE MATERIALS AND MECHANICS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. Study of different composite materials and finding its mechanical strength
2. Fabrication of FRP and other composites by different manufacturing methods
3. Stress analysis of fiber reinforced Laminates for different combinations of plies with different orientations of the fiber.
4. Calculation of stresses in the lamina of the laminate using different failure theories
5. Calculation of residual stresses in different types of laminates under thermo-mechanical load using the Classical Laminate Theory.

UNIT-I**INTRODUCTION TO COMPOSITE MATERIALS****9**

Definition-Matrix materials-polymers-metals-ceramics - Reinforcements: Particles, whiskers, inorganic fibers, metal filaments-ceramic fibers-fiber fabrication-natural composite wood, Jute-Advantages and drawbacks of composites over monolithic materials. Mechanical properties and applications of composites, Particulate-Reinforced composite Materials, Dispersion-Strengthened composite, Fiber-reinforced composites Rule of mixtures-Characteristics of fiber-Reinforced composites, Manufacturing fiber and composites

UNIT- II**MANUFACTURING OF COMPOSITES****9**

Manufacturing of Polymer Matrix Composites (PMCs)-handlay-up, spray technique, filament winding, Pultrusion, Resin Transfer Moulding (RTM)-, bag moulding, injection moulding, Sandwich Mould Composites (SMC) - Manufacturing of Metal Matrix Composites (MMCs) - Solid state, liquid state, vapour state processing, Manufacturing of Ceramic Matrix Composites (CMCs)-hot pressing-reaction bonding process-infiltration technique, direct oxidation-interfaces

UNIT-III**LAMINA CONSTITUTIVE EQUATIONS****9**

Lamina Constitutive Equations: Lamina Assumptions-Macroscopic Viewpoint. Generalized Hooke's Law. Reduction to Homogeneous Orthotropic Lamina - Isotropic limit case, Orthotropic Stiffness matrix (Q_{ij}), Definition of stress and Moment Resultants. Strain Displacement relations. Basic Assumptions of Laminated anisotropic plates. Laminate Constitutive Equations - Coupling Interactions, Balanced Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates. Laminate Structural Moduli. Evaluation of Lamina Properties from Laminate Tests. Quasi-Isotropic Laminates. Determination of Lamina stresses within Laminates.

UNIT-IV **LAMINA STRENGTH ANALYSIS AND ANALYSIS OF LAMINATED** **9**
FLAT PLATES

Introduction- Maximum Stress and Strain Criteria. Von-Misses Yield criterion for Isotropic Materials. Generalized Hill's Criterion for Anisotropic materials. Tsai-Hill's Failure Criterion for Composites. Tensor Polynomial (Tsai-Wu) Failure criterion. Prediction of laminate Failure Equilibrium Equations of Motion. Energy Formulations. Static Bending Analysis. Buckling Analysis. Free Vibrations– Natural Frequencies

UNIT- V **THERMO-STRUCURALANALYSIS** **9**

Fabrication stresses / Residual stresses in FRP laminated composites-Co-efficient of Thermal Expansion (C.T.E.) - Modification of Hooke's Law. Modification of Laminate Constitutive Equations. Orthotropic Lamina C.T.E's -Stress and Moment Resultants due cooling of the laminates during fabrication-Calculations for thermo-mechanical stresses in FRP laminates

Case studies: Implementation of CLT for evaluating residual stresses in the components made with different isotropic layers such as electronic packages etc.

TOTAL(L:45) = 45 PERIODS

COURSE OUTCOMES:

On Completion of the course the student will be able to

1. Calculate for mechanical strength of the composite material
2. Fabricate the FRP and other composites by different manufacturing methods
3. Analyze fiber reinforced Laminates for different combinations of plies with different orientations of the fiber.
4. Evaluate the stresses in the lamina of the laminate using different failure theories
5. Analyze thermo-mechanical behavior and evaluate residual stresses in different types of laminates using the Classical Laminate Theory.

REFERENCES:

1. Agarwal BD and Broutman LJ, "Analysis and Performance of Fiber Composites", John Wiley and Sons, New York,1990.
2. Gibson RF, Principles of Composite Material Mechanics, CRC press,4th Edition,2015.
3. Hyer MW and Scott R White, "Stress Analysis of Fiber – Reinforced Composite Materials",McGraw-Hill,1998
4. Issac M Daniel and Orilshai, "Engineering Mechanics of Composite Materials", OxfordUniversityPress-2006,FirstIndian Edition-2007
5. Madhujit Mukhopadhyay,"Mechanics of Composite Materials and Structures", University Press(India)Pvt.Ltd.,Hyderabad,2004(Reprinted 2008)
6. Mallick PK, Fiber – Reinforced Composites: Materials, Manufacturing and Design, CRC Press, 3rd Edition,2007.

COURSE OBJECTIVES:

1. To introduce the different components of hydraulic systems and its design and selection procedures.
2. To formulate a thorough understanding on the need and use of various control and regulating elements in hydraulic systems.
3. To enable them to independently design hydraulic circuits for industrial applications
4. To expose them to the different components of pneumatic systems and enable them to design simple pneumatic systems.
5. To make them understand the need to integrate electronics and develop low cost systems and provide solution to simple industrial applications

UNIT – I OIL HYDRAULIC SYSTEMS AND HYDRAULIC ACTUATORS 9

Hydraulic Power Generators – Selection and specification of pumps, pump characteristics. Linear and Rotary Actuators – selection, specification and characteristics, Hydrostatic drives, types, selection

UNIT – II CONTROL AND REGULATION ELEMENTS 9

Pressure - direction and flow control valves - relief valves, non-return and safety valves - actuation systems, Proportional Electro hydraulic servo valves

UNIT – III HYDRAULIC CIRCUITS 9

Reciprocation, quick return, sequencing, synchronizing circuits - accumulator circuits - industrial circuits - press circuits - hydraulic milling machine - grinding, planning, copying, - forklift, earth mover circuits design methodology- design and selection of components - safety and emergency mandrels – Cascade method

UNIT – IV PNEUMATIC SYSTEMS AND CIRCUITS 9

Pneumatic fundamentals - control elements, position and pressure sensing, Pneumatic equipments- selection of components - design calculations - logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods -mapping methods - step counter method - compound circuit design - combination circuit design-Karnaugh - Veitch map

UNIT – V ELECTROMAGNETIC & ELECTRONIC CONTROL OF HYDRAULICS & PNEUMATIC CIRCUIT 9

Electrical control of pneumatic circuits – use of relays, counters, timers, ladder diagrams, use of microprocessor in circuit design – use of PLC in hydraulic and pneumatic circuits – Fault finding– application -fault finding - hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Upon completion of this course, the students will be able to:

- CO1** Design and select appropriate pumps in industries based on need.
- CO2** Select correct sizing and rating of control elements in hydraulics.
- CO3** Design basic circuits (hydraulic) for industrial applications.
- CO4** Design basic pneumatic circuits for industrial applications.
- CO5** Identify and provide solution for troubleshooting and design low cost automation for industrial application.

REFERENCES:

1. Anthony Esposito, "Fluid Power with Applications", Prentice Hall, 2009.
2. Jagadeesha T, "Pneumatics Concepts, Design and Applications ", Universities Press, 2015
3. James A. Sullivan, "Fluid Power Theory and Applications", Fourth Edition, Prentice Hall, 1997
4. Majumdar, S.R., "Oil Hydraulics Systems – Principles and Maintenance", Tata McGraw Hill, 2001
5. Shanmuga Sundaram.K, "Hydraulic and Pneumatic Controls". Chand & Co, 2006

ED4079**QUALITY CONCEPTS IN DESIGN**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To impart knowledge on various concepts in engineering design, material selection and manufacturing methods.
2. To learn the principles of implementing quality in a product or services using different tools
3. To enhance the quality of product by use of failure mode effect analysis and implement methods to uphold the status of six sigma
4. To develop a robust product or service using various strategies of design of experiments
5. To maintain the quality of the product by use of statistical tools and enforce methods to improve the reliability of a product

UNIT – I DESIGN FUNDAMENTALS, METHODS AND MATERIAL SELECTION 9

Morphology of Design – The Design Process – Computer Aided Engineering – Concurrent Engineering – Competition Bench Marking – Creativity – Theory of Problem solving (TRIZ) – Value Analysis - Design for Manufacture, Design for Assembly – Design for casting, Forging, Metal Forming, Machining and Welding.

UNIT – II DESIGN FOR QUALITY 9

Quality Function Deployment -House of Quality-Objectives and functions-Targets-Stakeholders- Measures and Matrices-Design of Experiments –design process-Identification of control factors, noise factors, and performance metrics - developing the experimental plan- experimental design
– testing noise factors- Running the experiments –Conducting the analysis-Selecting and conforming factor-Set points-reflecting and repeating.

UNIT – III FAILURE MODE EFFECTS ANALYSIS AND DESIGN FOR SIX SIGMA 9

Basic methods: Refining geometry and layout, general process of product embodiment - Embodiment checklist-Advanced methods: systems modeling, mechanical embodiment principles-FMEA method- linking fault states to systems modeling - Basis of SIX SIGMA – Project selection for SIX SIGMA- SIX SIGMA problem solving- SIX SIGMA in service and small organizations - SIX SIGMA and lean production –Lean SIX SIGMA and services.

UNIT – IV DESIGN OF EXPERIMENTS 9

Importance of Experiments, Experimental Strategies, Basic principles of Design, Terminology, ANOVA, Steps in Experimentation, Sample size, Single Factor experiments – Completely Randomized design, Randomized Block design, Statistical Analysis, Multifactor experiments - Two and three factor full Factorial experiments, 2K factorial Experiments, Confounding and Blocking designs, Fractional factorial design, Taguchi’s approach - Steps in experimentation, Design using Orthogonal Arrays, Data Analysis, Robust Design- Control and Noise factors, S/N ratios

UNIT – V STATISTICAL CONSIDERATION AND RELIABILITY 9

Frequency distributions and Histograms- Run charts –stem and leaf plots- Pareto diagrams- Cause and Effect diagrams-Box plots- Probability distribution-Statistical Process control– Scatter diagrams –Multivariable charts –Matrix plots and 3-D plots.-Reliability-Survival and Failure-Series and parallel systems-Mean time between failure-Weibull distribution.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- CO1** apply fundamentals of design process and material selection for developing a quality product
- CO2** apply the quality concepts to develop a robust product
- CO3** perform Failure Mode Effect Analysis on a product and use six sigma principles to enhance its quality
- CO4** apply different experimental design methods in product development
- CO5** implement various statistical tools to improve its quality and reliability

REFERENCES:

1. Amitava Mitra, “Fundamentals of Quality control and improvement”, John Wiley & Sons, 2016
2. George E. Dieter, Linda C. Schmidt, “Engineering Design”, McGraw Hill Education Pvt. Ltd., 2013
3. Karl T. Ulrich, Steven D. Eppinger, “Product Design and Development”, Tata McGraw-Hill Education, 2015
4. Kevin N. Otto and Kristin L. Wood, “Product Design: Techniques in Reverse Engineering and New Product Development”, Prentice Hall, 2001
5. Montgomery, D.C., “Design and Analysis of Experiments”, John Wiley and Sons, 2017.
6. Phillip J. Ross, “Taguchi techniques for quality engineering”, Tata McGraw Hill, 2005.

MA4071 APPLIED PROBABILITY AND STATISTICS FOR DESIGN ENGINEERS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To compute moments of standard distributions.
- To gain the knowledge about correlation and regression.
- To provide the most appropriate estimator of the parameter in statistical inference.
- To decide whether to accept or reject specific value of a parameters.
- To understand many real-world problems fall naturally within the frame work of multivariate normal theory.

UNIT - I	ONE DIMENSIONAL RANDOM VARIABLES	9
Random variables - Probability functions – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.		
UNIT - II	TWO DIMENSIONAL RANDOM VARIABLES	9
Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Correlation – Linear Regression.		
UNIT- III	ESTIMATION THEORY	9
Unbiased estimators – Method of moments – Maximum likelihood estimation - Principle of least squares – Regression lines.		
UNIT - IV	TESTING OF HYPOTHESIS	9
Sampling distributions – Type I and Type II errors – Small and large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.		
UNIT - V	MULTIVARIATE ANALYSIS	9
Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components - Population principal components – Principal components from standardized variables		

TOTAL : 45 PERIODS

COURSE OUTCOMES :

After completing this course, students should demonstrate competency in the following topics:

- Moments of discrete and continuous random variables.
- To deal problems involving two dimensional random variables.
- Unbiasedness of estimators, method of maximum likelihood estimation and Central Limit Theorem.
- Use statistical tests in testing hypotheses on data.
- Perform exploratory analysis of multivariate data, such as multivariate normal density, calculating descriptive statistics, testing for multivariate normality.

REFERENCES :

1. Devore, J. L., "Probability and Statistics for Engineering and the Sciences", 8th Edition, Cengage Learning, 2014.
2. Dallas E. Johnson, "Applied Multivariate Methods for Data Analysis", Thomson and Duxbury press, 1998.
3. Gupta S.C. and Kapoor V.K.," Fundamentals of Mathematical Statistics", 12th Edition, Sultan and Sons, New Delhi, 2020.
4. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers ", 9th Edition, Pearson Education, Asia, 2016.
5. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", 6th Edition, Pearson Education, Asia, 2012.

AUDIT COURSES

AX4091	ENGLISH FOR RESEARCH PAPER WRITING	L T P C 2 0 0 0
---------------	---	----------------------------------

OBJECTIVES

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I	INTRODUCTION TO RESEARCH PAPER WRITING	6
---------------	---	----------

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II	PRESENTATION SKILLS	6
----------------	----------------------------	----------

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III	TITLE WRITING SKILLS	6
-----------------	-----------------------------	----------

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV	RESULT WRITING SKILLS	6
----------------	------------------------------	----------

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V	VERIFICATION SKILLS	6
---------------	----------------------------	----------

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES

- CO1 –Understand that how to improve your writing skills and level of readability
- CO2 – Learn about what to write in each section
- CO3 – Understand the skills needed when writing a Title
- CO4 – Understand the skills needed when writing the Conclusion
- CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

OBJECTIVES

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 6

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 6

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA 6

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT 6

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS**COURSE OUTCOMES**

CO1: Ability to summarize basics of disaster

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES

1. Goel S. L., Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "NewRoyal book Company, 2007.
3. Sahni, PardeepEt.Al. , " Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

COURSE OBJECTIVES

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S.N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

UNIT I சங்க இலக்கியம்

6

1. தமிழின் துவக்க நூல் தொல்காப்பியம்
- எழுத்து, சொல், பொருள்
2. அகநானூறு (82)
- இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி
4. புறநானூறு (95,195)
- போரை நிறுத்திய ஔவையார்

UNIT II அறநெறித் தமிழ்

6

1. அறநெறி வகுத்த திருவள்ளுவர்
- அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புறவு அறிதல், ஈகை, புகழ்
2. பிற அறநூல்கள் - இலக்கிய மருந்து
- ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை (தூய்மையை வலியுறுத்தும் நூல்)

UNIT III இரட்டைக் காப்பியங்கள்

6

1. கண்ணகியின் புரட்சி
- சிலப்பதிகார வழக்குரை காதை
2. சமூகசேவை இலக்கியம் மணிமேகலை
- சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை

UNIT IV அருள்நெறித் தமிழ்

6

1. சிறுபாணாற்றுப்படை
- பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்
2. நற்றிணை
- அன்னைக்குரிய புன்னை சிறப்பு
3. திருமந்திரம் (617, 618)
- இயமம் நியமம் விதிகள்
4. தர்மச்சாலையை நிறுவிய வள்ளலார்
5. புறநானூறு
- சிறுவனே வள்ளலானான்
6. அகநானூறு (4) - வண்டு
நற்றிணை (11) - நண்டு
கலித்தொகை (11) - யானை, புறா
ஐந்திணை 50 (27) - மான்
ஆகியவை பற்றிய செய்திகள்

UNIT V நவீன தமிழ் இலக்கியம்

6

1. உரைநடைத் தமிழ்,
 - தமிழின் முதல் புதினம்,
 - தமிழின் முதல் சிறுகதை,
 - கட்டுரை இலக்கியம்,
 - பயண இலக்கியம்,
 - நாடகம்,
2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,
5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

TOTAL: 30 PERIODS

தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University)
 - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia)
 - <https://ta.wikipedia.org>
3. தர்மபுர ஆதின வெளியீடு
4. வாழ்வியல் களஞ்சியம்
 - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம்
 - தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம்
 - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்